

2011 Special Program: Two-Phase Flow, Interface Flow and Related Phenomena

From renewable energy to energy saving: Fluid and thermal aspect

2011 - 12 - 21 (Wed.)

15:00 - 17:00

308, Mathematics Research Center Building (ori. New Math. Bldg.)

Renewable energies often exist in fluid and thermal forms, meaning we can take elements such as wind, water, or heat, etc. and convert them into renewable energies. This presentation is to describe how the Group of Energy Conversion Laboratory in National Cheng Kung University is dedicated to the study and development of renewable energy and energy saving products using the fundamental theory of fluid dynamics and thermal dynamics, which evolved from the turbomachinery technology developed for gas and rocket engines. More than 30 patents are involved in related products so far. The presentation is to give a broad view of what has been done in the past and what is going to be done in the future, rather than giving details of a specific technology. Some selected research and development topics are presented, and will cover wind turbine, solar thermal energy application, hydro turbines, and truck drag reduction devices. For the wind turbine design, aerodynamically optimized shrouded design proved itself to be the highest efficiency in the same category in commercial product. Blade number effects on the performance are discussed. The solar thermal energy studies cover solar ventilation, solar heating, power generation, and air-conditioning. In the hydro power studies, the applications cover the ocean tidal power energy conversion and river low pressure hydro turbine designs. For the energy saving product, the truck drag reduction device with two nozzles installed at the rear corner is introduced. Computer simulation and wind tunnel testing showed that 15% fuel saving can be achieved, with proper choosing of the nozzle area ratio and the flow turning angle. These studies were supported by a private green energy company that jointly developed the products and lead the commercialization.

